## Emmanuel Catholic College Science Department

**Year 9 Science Program – Semester One 2018**

**Term 1**

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| **Week** | **Number of lessons** | **Learning Goals** | **Activities** | **Assessment** |
| **Week 1**29/1-2/2 | **2** | **Introduction** * Laboratory safety procedures and guidelines.
* Introduction to content and unit outline.
* Review of lab rules.
 | ACTIVITY: Lab safety rules refresher kahoot |  |
| **Week 2**5/2-9/2 | **4** | **Ecology** * Define biosphere, ecosystem, biotic, abiotic, habitat, population and community.
* Describe an ecosystem as the interaction between the abiotic conditions and the biotic community.
* Explain the flow of energy in an ecosystem in terms of origins, flow and recycling.
 | ACTIVITY: Label or draw carbon cycle diagram  |  |
| **Week 3**12/2-16/2 | **4** | **Ecology** * Provide examples of abiotic factors such as light, temperature, pH, and water quality and oxygen availability in various ecosystem
* Provide examples of biotic factors in various ecosystem
* Explain how organisms relate within a species through collaboration, mating, symbiosis, commensalism, parasitism and competition.
* Describe non-symbiotic relationships, including predator-prey relationships.
* Using the concept of food chains and food webs identify the main factors that increase and decrease population size.
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| **Week 4**19/2-23/2Swimming Carnival 21/2 | **4** | **Ecology** * Define emigration and migration.
* Define biological control, disease and immune.
* Example: Describe the effects rabbit have on Australia ecosystems.
* Explain why Myxoma is no longer effective in most parts of Australia.
 | VIDEO: David Attenborough predatorsStile lesson  | Ecology Test (20%) |
| **Week 5**26/2-2/3Yr 9 BushrangersCamp28/2-2/3 | **4** | **Ecology** * Draw and label cross-section of a leaf.
* Describe the functions of the cells inside the leaf – wax cuticle, upper epidermis, palisade mesophyll, spongy mesophyll, guard cells and stomata chloroplasts.
* State the word equation for photosynthesis.
* Relating photosynthesis to explain that energy is passed through ecosystems through food chains in the form of glucose.
* Example: Describe some of the adaptions some Australian plants have to fire.
* Explain the detrimental affect of flood and drought to both terrestrial and marine ecosystems.
 | PRACTICAL: Onion investigation: Testing for sugar (benedict’s test) |  |
| **Week 6**5/3-9/3Labor Day 5/3Year 9 Bush Rangers Camp 7-9/3 | **3** | **Ecology** * Relate increasing human populations with ecological impacts directly related to increased carbon dioxide in the ocean causing it to become acidic (coral bleaching) and the green sea turtle.
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| **Week 7**12/3-16/3 | **4** | **Chemistry*** Define atomic theory – all matter is made up of atoms.
* Describe the evidence that supports atomic theory.
* Draw and define protons, neutrons, electrons and nucleus.
* Introduce the periodic table and element symbols – first 20 plus silver, gold, iron, copper and lead.
* Define mass number and periodic table.
* Describe how the elements are ordered on the periodic table.
* Name the following features on the periodic table – periods, groups, noble gases, halogens, alkali metals, alkali Earth metals, transition metals and non-metals
* Calculate mass number.
* Calculating the number of electrons and protons.
* Explain the difference between atomic number and atomic mass.
 | VIDEO: TedEd: How Big is an Atom?VIDEO: The periodic table song ACTIVITY: Element bingo  |  |
| **Week 8**19/3-23/3 | **4** | * Describe the characteristics of acidic and basic substances
* Provide examples of acids and bases
* Explain the structure of the pH scale – 7 is neutral, < 7 is acidic and > 7 is basic
* Use universal indicator and litmus paper to determine the pH of a substance
* Understand that a reaction between an acid and a base is called a neutralisation reaction. Use chemical and word equation examples.
 | OXFORD: Practical: Flame Test 7.4  | Acid and Base Investigation (20%) |
| **Week 9**26/3-30/3Good Friday30/3 | **3** | **Chemistry** * Define the term ion and explain the formation of them through

 the loss of gain of electrons.* Understand that ions that gain electrons become anions with

a negative charge.* Understand that ions that lose electrons become cations with

 a positive charge.* Students are able to identify patterns on the periodic table and

within the elements themselves of charges and why they have that valency.* Students are able to begin combining anions and cations formulae correctly. Using symbols and names.
* Electron shell diagrams
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| **Week 10**2/4-6/4 Easter Monday 2/4Easter Tuesday 3/4 | **2** | **Chemical Reactions*** Define reactants and products
* Describe the law of conservation of mass
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| **Week 11**9/4-13/4Emmanuel Day 9/4X-country 13/4 | **2** | **Chemical Reactions** * Investigate and write example word and chemical equations for basic chemical reactions (decomposition, synthesis)
* Balancing simple equations
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**Term 2**

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| **Week** | **Number of lessons** | **Learning Goals** | **Activities** | **Assessment** |
| **Week 1**30/4-4/5Start 1/5 | **3** | **Theory of Conservation of Mass*** Review the theory of conservation of mass. Understand that during a chemical reaction atoms are not created or destroyed but they are rearranged.
* Define ‘reactants’ as the chemical species present at the start of a reaction.
* Define ‘products’ as the chemical species present at the end of a reaction.
* Write a word equation to represent the conversion of reactants to products in a particular reaction
* Use chemical formulae to write a chemical equation to represent the conversion of reactants to products in a particular reaction.
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| **Week 2**7/5-11/5Interhouse athletics carnival 11/5  | **3** | **Chemical Formula*** Identify chemical reactions from word equations and use common compound formula and names.
* Understand that a chemical reaction must be balanced (same number and types of atoms both before and after the arrow). Investigate and write example word and chemical equations for basic chemical reactions (decomposition, synthesis)
* Balancing simple equations
 |  |  |
| **Week 3**14/5-18/5NAPLAN 15/5-17/5 | **4** | **Energy in a Chemical Reaction*** Understand that energy is needed in a reaction to break the reactant bonds.
* Understand that energy can be absorbed or released in a chemical reaction.
* Define an **exothermic** reaction as one in which energy is released to the surroundings.
* Define an **endothermic** reaction as one in which energy is absorbed from the surroundings.

**Review of Acid/Base*** Review acid and base properties from term 1:
	+ Describe the properties of acids; contain at least one hydrogen atom, tend to react with metals, taste sour, low pH.
	+ Describe the properties of bases; high pH, taste bitter, slippery to touch, react with fats/oil.
	+ List examples of common acids and bases
	+ Define pH as a measure of the amount of hydrogen ions in a solution.
	+ Litmus and universal indicator are used to determine the pH of various solutions.

**Neutralisation*** Understand that a reaction between an acid and a base is called a neutralisation reaction. Identify the products of neutralisation reactions as salt and water. Use chemical and word equation examples.
 | Exothermic and Endothermic Reaction Practicals: Making a hand warmer.Hydrogen gas test |  |
| **Week 4**21/5-25/5 | **4** | **Neutralisation*** Understand a reaction between acid and a metal carbonate/bicarbonate produces salt, water and carbon dioxide. Use chemical and word equation examples.
* Understand the reaction between acids and metals produce salt and hydrogen. Use chemical and word equation examples.

**Combustion*** Understand that a combustion reaction involves a fuel reacting with oxygen.
* Explain that energy is released during a combustion reaction.
* Explain how the products of combustion reactions can affect the environment.
* Identify respiration as a combustion reaction.
* Write balanced chemical equations for combustion reactions.

**Oxidation*** Understand that oxygen and metal react to form metal oxide.
* Use simple chemical and word equation examples.
	+ Magnesium and oxygen
	+ Iron and Oxygen
* Identify oxidation reactions as exothermic.
* Describe rust as a oxidation reaction.
 |  | Task 4: Test 3: Chemical Reactions Test (20%). (21/5).  |
| **Week 5**28/5-1/6  | **2** |  **Radioactivity*** Explain what is meant by term ‘Radioactivity’ in relation to elements and atoms.
* Explain background radiation
* Explain how radioisotopes exist and the processes they go through to become stable.
* Compare Alpha, Beta and Gamma Radiation: properties and uses of each.
 |  | Task 5: Inquiry 2: Radiation Inquiry: HAND OUT 31/5. (1 lessons in class 31/5).  |
| **Week 6**4/6-8/6Public Holiday 4/6 | **3** | **Radiation*** Use Half-Life calculations and explain how we apply this to radioisotopes.
* Elaborate on the different types of radiation, its effects and how we are using radiation in the world around us.
* Identify the uses of Radiation in Medicine: X-rays, Radioactive dye, technetium-99m biphosphate bone scan.
 |  | Task 5: Inquiry 2: Radiation Inquiry: (1 lessons in class 5/6). Due 7/6. |
| **Week 7**11/6-15/6 | **3** | **Plate Tectonics*** Identify prior understanding through questioning about creation and causes of mountains and earthquakes.
* Identify and label the layers of the Earth and common properties of each layer. These layers include the Crust, Mantle, Inner Core and Outer Core.
* Explain the concept of plate tectonics and label the different plates.
* Explain movement of plate tectonics and provide evidence of this. They should be able to identify the scientists credited with the development.

**Heat Energy:** * Explain the movement of heat energy using plate tectonics and convection currents
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| **Week 8**18/6-22/6 | **4** | **Tectonic Plate Movements*** Explain concepts of diverging and converging plates and the results of this movement also looking at the potential effects of transform boundaries. This causes of these movements need to be related to convection currents and movement in the mantle.
* Explain how new islands are being formed and the continual changes that are happening to the continents and how Earth will change in its appearance.
* Use knowledge of tectonic plate movement to explain the movement that will be occurring in the future and how this will change in the years to come.
 | Case study: Architecture and building design in Japan and New Zealand |  |
| **Week 9**25/6-29/6 | **4** | **Tectonic Plate Movements*** Use knowledge of tectonic plates to explain the natural disasters and phenomenon they create.
* **Research into natural disasters, measurements and precautionary measures.**
 | STEM Task Card: build a structure that can withstand an earthquake |  |

**TERM 3**

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| **Week** | **Number of lessons**  | **Learning Goals** | **Activities** | **Assessment** |
| **Week 1**16/7-20/7 | **3** | **Responding to Stimuli and Sense Organs*** Briefly recall the various systems within the human body. Such as Nervous, Circulatory, Digestive and Respiratory and relate to changes and responses in this system.
* Review the 7 requirements of life: using MRS GREN. Link these requirements to each of the body systems.
* Briefly discuss that we will focus this on the co-ordination of the systems that help us respond to changes in the environment namely nervous and endocrine
* Explain and define a stimulus and are able to provide explanations through examples. Understand that the body responds to stimuli – changes in the environment (external stimuli) and changes within the body (internal stimuli).
* Define the term homeostasis and relate to stimuli and responses.
* External: light, pressure, gravity, sound, chemicals, temperature.
* Internal: temperature, gas/pH/solute concentrations, osmotic potential
 |  |  |
| **Week 2**23/7-27/7 | **4** | **Sense Organs*** List the sense organs and how we detect stimuli using the sense organs: eye, ear, tongue, nose, skin.
* Explain how each of the sense organs structures assists them in detection of stimuli.
* 5 types of receptors within the sense organs.
* Identify the different parts within the ear and how they work together to allow us to hear the sound waves.
 | Senses practicals: test touch response |  |
| **Week 3**30/7-3/8 | **4** | **The Eye** * Focus on the eye; anatomy of eye, function of rods and cones.
* Label diagram of the eye.
* Dissection of a cow eye (Discuss animal ethics)
* Identify different types of eye defects/dysfunctions: myopia, hyperopia, colour-blindness, cataracts, astigmatism.
* Investigate cornea transplant and laser eye surgery.
 | Cow eye dissection |  |
| **Week 4**6/8-10/8  | **4** | **Energy and Transfer of Heat Energy*** Recall that there are different forms of energy (heat, light, sound, electricity etc.).
* Recall that matter is made up of particles that are arranged and behave differently in solids, liquids and gases.

**Light Energy*** Understand that there is a spectrum of electromagnetic radiation.
* Explain that light is a form of electromagnetic radiation and light energy moves as a transverse wave.
* Draw a labelled diagram of a light wave.
* Define wavelength as the distance between successive crests or troughs in a light wave.
* Describe a transparent substance as one that light passes straight through and objects on the other side can be clearly seen.
* Describe a translucent substance as one that light passes through but objects on the other side appear distorted (not seen clearly).
* Describe an opaque substance as one that light can’t pass through.
* List examples of transparent, translucent and opaque substances.
* Explain that when light hits a shiny surface (mirror) the light is reflected (bounces off).
* State the Law of Reflection: when light hits a smooth shiny surface it bounces off at the same angle from which it came (the angle of incidence = the angle of reflection).
* Understand that the ‘normal’ is the line perpendicular to the surface of the medium.
* Draw a labelled diagram to show the reflection of light by a plane mirror
 |  | **Task 1: Test 1: Sense organs** |
| **Week 5**13/8-17/8  | **3** | **Science week activities** * Science Week Activities
 |  |  |
| **Week 6**20/8-24/8  | **4** | **Light Energy*** Understand that when light hits a curved mirror the law of reflection results in the image being distorted because the reflected light rays either converge or diverge.
* Draw labelled diagrams to illustrate the behaviour of light hitting concave and convex mirrors.
* Understand that refraction is the bending of light as it moves between mediums of different density.
* Explain that when light passes from a less dense medium into a denser medium it bends towards the normal (e.g. air into water).
* Explain that when light passes from a denser medium into a less dense medium it bends away from the normal (e.g. water into air).
* Draw diagrams to illustrate the refraction of light energy and show the apparent position of objects.
* Recall that ‘white light’ is actually a combination of light waves with different frequencies and wavelengths.
* Recall that red light has a lower frequency and wavelength than blue light.
* Understand that dispersion of light is the splitting of white light into the colours of the rainbow (ROYGBIV).
 | Light and mirrors |   |
| **Week 7**27/8-31/8 | **4** | **Wave Energy*** Recall that some forms of energy travel by means of waves.
* Understand that energy can travel via transverse waves or compression waves.
* Examine wave energy diagrams and identify the type of wave (transverse or compression).

**Sound Energy*** Explain that sound energy travels using compression waves generated by a vibrating object.
* Define wavelength as the distance between successive compressions or rarefactions in a sound wave.
* Define frequency as the number of vibrations or per second
* Define amplitude as the maximum distance that each particle in a wave moves away from its usual resting position.
* Understand that the period of a wave relates to the time it takes for one complete wavelength to occur.
* Draw a labelled diagram of a sound wave.
 |  |  |
| **Week 8**3/9-7/9 | **4** | **Sound Energy*** Understand that human hearing relies on vibrations being transferred from the air, through the various parts of the ear and the auditory nerve that sends signals to the brain.
* Identify the main parts of the human ear.
* Describe the relationship between the frequency of a sound and its pitch (higher frequency = high pitch).
* Describe the relationship between the amplitude of a sound wave and the intensity (loudness) of the sound (large amplitude = more intense sound).
* State that sound energy is measured in units called decibels.
* Explain the relationship between the number of decibels and the thresholds of pain and hearing.
 |  | **Task 2: Test 2: Energy** |
| **Week 9**10/9-14/9 | **4** | **Energy and Transfer for Heat Energy*** Define conduction as the transfer of energy through the collisions of particles.
* List substances that are good conductors of heat energy as well as substances that are poor conductors of heat energy.
* Define convection as the transfer of heat energy through the movement of particles in a fluid (warmer and less dense rises, cooler and more dense sinks)
* Use the particle model of matter to explain the transfer of heat energy via conduction and convection.
* Explain that convection currents in the atmosphere cause sea breezes.

**Electricity** * Define electric charge, electrons, protons, electrostatic charge, electric circuit, electrical conductor, electrical insulator and semiconductor
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| **Week 10**7/9-21/9 | **4** |  **Electricity** * Describe the difference between static electricity and electric current
* Identify the key components of an electric circuit
* Define electric current and circuit diagrams
* Provide examples of circuit components and identify their diagram symbols
* Explain how an ammeter measures current
* Draw appropriate circuit diagrams
* Define series, parallel and short circuit
* Describe the differences in arrangement of series and parallel circuits
 | BRAIN BOX | Task 3: Inquiry: Practical and Validation: Conductors: electricity and heat |

**TERM 4**

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| **Week** | **Number of lessons**  | **Learning Goals** | **Activities** | **Assessment** |
| **Week 1**8/10-12/108/10 Pupil Free Day | **3** | **Endocrine System*** Explain the concept of systems working together in our body and that we have two systems to assist in response to stimuli: endocrine and nervous.
* Label a diagram of the endocrine system showing major glands
* Identify organ/gland, hormone, target area and main effects of several key human hormones (Insulin, Oestrogen, testosterone, adrenaline and the pituitary gland and thyroid)
 | Hormone flow chart |  |
| **Week 2**15/10-19/10 | **4** | **Endocrine System*** Briefly explain the concept of homeostasis and briefly describe the process of thermoregulation.
* Endocrine system scan develop disorders and not respond correctly.
* Use Diabetes as example of explaining disorder and disease in the endocrine system: compare normal pancreatic functions to those of a diabetic person.
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| **Week 3**22/10-26/10 | **4** | **Nervous System*** Introduce the nervous system; compare the fast control of nerves to the slow control of hormones.
* State, describe and label the organs of the nervous system including brain, spinal cord and nerves. Explain their role in the system

**Research Task** |  | **Task 4: Inquiry 2: Nervous system & Cannabis Case study** |
| **Week 4**29/10-2/11  | **4** | **Brain & Neurons*** Explain the structure of a neuron and briefly how the neuron works efficiently. Use terms such as axon, myelin sheath, dendrites, synapses and neurotransmitters.
* Identify the 3 different types of neurons. Describe the different functions of each.
* Identify and label the parts of the brain and the basic function of each. Occipital lobe, parietal lobe, temporal lobe, frontal lobe, Cerebral cortex, cerebellum, hypothalamus.
 | Brain dissection/demo |  |
| **Week 5**5/11-9/11 | **4** | **Disease and Pathogen*** Define the terms disease and pathogens.
* Give examples of pathogens and their unique features. (Flatworm, Fungus, Protozoan, Bacterium, Virus, Prion)
* Explain the germ theory.
* Distinguish and give examples of infectious and non-infectious diseases

**Immunity*** Students explain that as a response to pathogens and disease our body has an Immune System that acts to protect against foreign invaders. Students define each line of defence through its components and role in the body. This includes terms such at phagocytes, antigen, antibodies and vaccination.
* Treatment of infectious diseases. Discuss use of antibiotics
 | Agar plates and growing bacteria. |  |
| **Week 6**12/11-16/11 | **4** | **Research:****When things go wrong with the immune system and developments in technology**Type 2 DiabetesArtificial SkinVaccinationsDevelopment of Antibiotics and CreationAllergies: anaphylaxisAutoimmune diseases |  |  |
| **Week 7**19/11-23/11 | **4** | **Revision**  |  |  |
| **Week 8**26/11-30/11 |  | **Year 9 Exam week**  |  | Task 5: Exam  |
| **Week 9**3/12-7/12 | **4** | **Review exam** **STEM task cards and activities.**  |  |  |